Monitoring report form (Version 03.1)

Monitoring report

Title of the project activity	Nueva Aldea Biomass Power Plant Phase 2
Reference number of the project activity	UNFCCC 0346
Version number of the monitoring report	1
Completion date of the monitoring report	12/03/2013
Registration date of the project activity	2 June, 2006
Monitoring period number and duration of this monitoring period	Monitoring period 5 (from 01 January 2011 to 31 December 2012) – both days included.
Project participant(s)	Celulosa Arauco y Constitución S.A.
Host Party(ies)	Chile
Sectoral scope(s) and applied methodology(ies)	ACM0006 (Version 02) - "Consolidated methodology for grid-connected electricity generation from biomass residues". ACM0002 (Version 04): "Consolidated methodology for grid-connected electricity generation from renewable sources".
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	Estimated amount of GHG emission reductions from 01 January 2011 to 31 December of 2012:**252,288(tCO_{2eq}).**
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	The total net emission reduction claimed in the monitoring period from 01 January of 2011 to 31 December of 2012 (both days are included):**85,044 (tCO_2eq).** –

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

The project activity consists in a new 37 MW grid-connected biomass cogeneration power plant located inside a forestry complex by Arauco: the Nueva Aldea Complex or the Nueva Aldea Project. The power plant consists in a new pulp mill equipped with 2 X 70 MW gross generation capacity, of which 37 MW are destined to power generation to the grid.

The project activity is designed to use black liquor[1] (biomass) for steam and electric power generation in a cogeneration power plant located inside a new bleached pulp mill site. The project activity is owned by Celulosa Arauco y Constitución S.A. (from now on, Arauco), a leading forestry and pulp-producing company in Chile.

Though modern pulp mills are currently designed to be self-sufficient in terms of steam and electric power generation, the Nueva Aldea pulp mill was deliberately designed to generate a considerable amount of surplus power to the grid. Considering the higher cost of building a pulp mill with additional power generation to the grid, the decision of building such power plant relied on the possibility of selling the excess power to the grid and on the benefits of being a CDM project activity.

The project activity assists Chile's sustainable growth by providing electricity to the Nueva Aldea Industrial Complex and to the SIC through biomass power generation, which is a clean and renewable energy source. The Nueva Aldea Phase 2 project participants believe that biomass power generation constitutes a sustainable source of power generation that brings clear advantages to mitigate global warming. Using the available natural resources in a rational way, the Nueva Aldea Phase 2 project activity helps to promote the development of renewable energy sources in Chile, in particular the use of biomass generated as a by-product of the forestry industry, which has a significant potential in the country. The project is a good example to demonstrate the viability of power generation as a source of revenue not only to the Pulp industry, but also to all forest-related industries. It is worthy to highlight, however, that very few pulp mills in Chile have this additional power generation capacity, making the Nueva Aldea Power Plant Phase 2 quite unique and particular in its type. Although this technological improvement is consistent with the internal policies of efficient energy usage of Arauco; it must be recognized as an initiative that goes beyond the common practice of the Pulp industry in Chile.

Relevant dates for the project activity:

Date (DD/MM/YY)	Key events
March 2005	Approval permits to start construction activities
31/08/2006	Commissioning start date
01/04/2007 to 30/09/2007	The 1st monitoring period
01/10/2007 to 30/09/2008	The 2nd monitoring period
01/10/2008 to 31/12/2009	The 3rd monitoring period
01/01/2010 to 31/12/2010	The 4th monitoring period
01/01/2011 to 31/12/2012 (both days included)	The 5th monitoring period (this report)

The total net emission reduction claimed in the monitoring period from 01 January 2011 to 31 December 2012 (both days included) is: **85,044** (tCO_2eq).

Where:

- From 01January 2012 to 31December 2012 the total net emission reductions is: **22,314** (tCO_2eq).
- From 01January 2012 to 31December 2012 the total net emission reductions are **62,730** (tCO_2eq).

[1] Black liquor is an organic by-product of the pulp production Kraft cycle and falls under the category of *biomass residue*, according to the "Clarifications of definitions of biomass and consideration of changes in carbon pools due to a CDM project activity", Annex 8, of 20th Executive Board meeting report.

A.2. Location of project activity

The proposed project activity is located in the Nueva Aldea Industrial Complex site. The Nueva Aldea Industrial Project is located near the Nueva Aldea community area, Comuna of Ránquil, in the province of Ñuble. It is 30 km. west of the Chillán city and 28 km. Southeast of the Coelemu city in the VIII Region (Bío-Bío Region), Chile. The project site is centered at the geographical coordinates 36°39´18" S and 72°28´31" N.

A.3. Parties and project participant(s)

Party involved ((host) indicates a host Party)	**Private and/or public entity(ies) project participants (as applicable)**	**Indicate if the Party involved wishes to be considered as project participant (Yes/No)**
Chile (host)	Celulosa Arauco y Constitución S.A.	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party (ies) involved is required.		

A.4. Reference of applied methodology

The name of the approved baseline methodology applied to the proposed project activity is:

ACM0006 (Version 02): "Consolidated methodology for grid-connected electricity generation from biomass residues".

The project activity also relies on the following methodology:

ACM0002 (Version 04): "Consolidated methodology for grid-connected electricity generation from renewable sources".

A.5. Crediting period of project activity

Starting date of the first crediting period:	01/04/2007 (See Note below)
End date of the first crediting period:	31/03/2014
Length of the first crediting period:	Seven (7) years
Maximum length of the crediting period:	3 x Seven (7) years

Note that the original starting date established in the registered PDD was 01/08/2006. Due to some technical problems during the start-up operation, the Project Participant requested a delay of 8 months starting date of the first crediting period in April 1st, 2007. The Project Participant can apply for a renewable of the crediting period at most two times.

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

The project activity has been completed as planned and described in the Project Design Document (PDD). The starting date of the operation of the project activity was 01/04/2007 and it has operated as described in the CDM PDD:

Description of plant operation during the 5th period (Jan 01, 2011 – Dec 31, 2012)

The Project Participant presents information about the operation of the project activity occurred during these monitoring periods i.e. shutdown/stoppages due to the regular maintenance program and also irregular stoppages. The events identified during the monitoring period are listed as follows:

2012	Out of service day	Starting day	Number of hours	Comments
General stoppage	14/08/2012	23/08/2012	n/a	General stoppage.
Maintenance Stoppage				
– **Recovery boiler**	n/a	n/a	n/a	n/a
– **Turbo generator (TG2)**	n/a	n/a	n/a	n/a
– **Turbo generator (TG3)**	01/01/2012 01/02/2012 01/03/2012 01/04/2012	n/a n/a n/a n/a	744 696 744 721	Operational problems carried out from 2011.The turbo generator (TG3) started operating in May, 2012.

Instrument replacements during year 2012:

	Date	Old serial number	New serial number
552-FT-378 - Black Liquor Flow Meter (Nozzle) (1-3)	14/08/2012	000402556/X001	00045089/X010
568-PML-52B-Energy Meter Switchgear (5-2B)- ION 7330.	03/01/2012	PB-0501A419-11	PB-1108A463-11

2011	Out of service day	Starting day	Number of hours	Comments
General stoppage	08/08/2011	20/09/2011	n/a	n/a
Maintenance Stoppage.				
– **Recovery boiler**	n/a	n/a	n/a	n/a
– **Turbo generator (TG2)**	n/a	n/a	n/a	n/a
– **Turbo generator (TG3)**	01/10/2011 01/11/2011 01/12/2012	n/a.	744 720 744	Out-of service due to operational problems. Note that this situation still continue in 2012.

Instrument replacements during year 2011:

	Date	Old serial number	New serial number
568-PML-12-Energy Meter Switchgear (1-2)- ION 7330.	27/12/2011	PB-0502A108-11	PB-1108A449-11
568-PML-25-Energy Meter Switchgear (2-5)- ION 7330.	16/09/2011	PB-0502A245-11	PB-1001A347-11
568-PML-51-Energy Meter Switchgear (5-1)- ION 7330.	27/12/2011	PB-0412A453-11	PB-1108A602-11
568-PML-52A-Energy Meter Switchgear (5-2A)- ION 7330.	27/12/2011	PB-0501A419-11	PB-1108A463-11
568-PML-61-Energy Meter Switchgear (2-5)- ION 7330.	27/12/2011	PB-0501A503-11	PB-1108A595-11
568-PML-62A-Energy Meter Switchgear (2-5)- ION 7330.	27/12/2011	PB-0501A033-11	PB-1108A462-11

No events or situations occurred during the monitoring period that may impact the applicability of the methodology.

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan or applied methodology

There has not been any request for deviation applied to this monitoring period.

B.2.2. Corrections

Not Applicable.

B.2.3. Permanent changes from registered monitoring plan or applied methodology

Two revisions were performed to the monitoring plan; both have been approved by the EB. Each of them is described as follows:

The first revision performed to the monitoring plan was approved by the EB in 10/10/2008. In this case, the monitoring plan was revised due to the project participant determined the net electricity displaced from the grid, by directly measuring the surplus of electric power delivered to the grid by the new biomass power plant, instead of using equation 13 of the ACM0006 (Version 02).

Although the approach described above was accepted and the project activity was successfully registered, in order to follow the guidelines or rules of the CDM, during the first verification the DOE submitted a revised monitoring plan to follow the equation 13. The revised monitoring plan was approved and used by the Project Participants.

The second revision performed to the monitoring plan was approved by the EB in 05/04/2012. In this case, the monitoring plan was revised in order to increase its completeness according to the methodology ACM0006 (Version 02).

Consequently of applying the revised (approved) monitoring plan, the net quantity of increased electricity generation, as a result of the project activity (incremental to the baseline generation), is determined using the net terms of equation 13 of ACM0006 (Version 02) instead of using gross terms of this equation.

The net quantity of electricity generated in the project plant is the result of the measurements of gross quantity of electricity generated by the project minus total auxiliary electricity consumption required for power plant operation. The net energy efficiency of electricity generation in the reference plant is used instead of gross energy efficiency of electricity of the reference plant. This value will remain fixed during the crediting period in accordance to the methodology ACM0006 (Version 02).

Considering the above the monitoring plan is in accordance with the approved monitoring methodology applicable to the project activity whilst ensuring the conservativeness of the emission reduction calculations. Therefore, the revised monitoring plan was approved and was used by the Project Participants.

B.2.4. Changes to project design of registered project activity

There have been no changes to the project design of the registered project activity.

B.2.5. Changes to start date of crediting period

The original starting date established in the registered PDD was 1st August, 2006. Due to some technical problems during the start-up operation, the Project Participant requested a delay of 8 months for the starting date. Therefore, the starting date of the first crediting period was 1st April, 2007.

B.2.6. Types of changes specific to afforestation or reforestation project activity

Not applicable.

SECTION C. Description of monitoring system

The Project Participant (Arauco) has implemented monitoring procedures according to the methodology chosen for this project activity. This methodology accounts for emission reductions in an accurate and conservative manner.

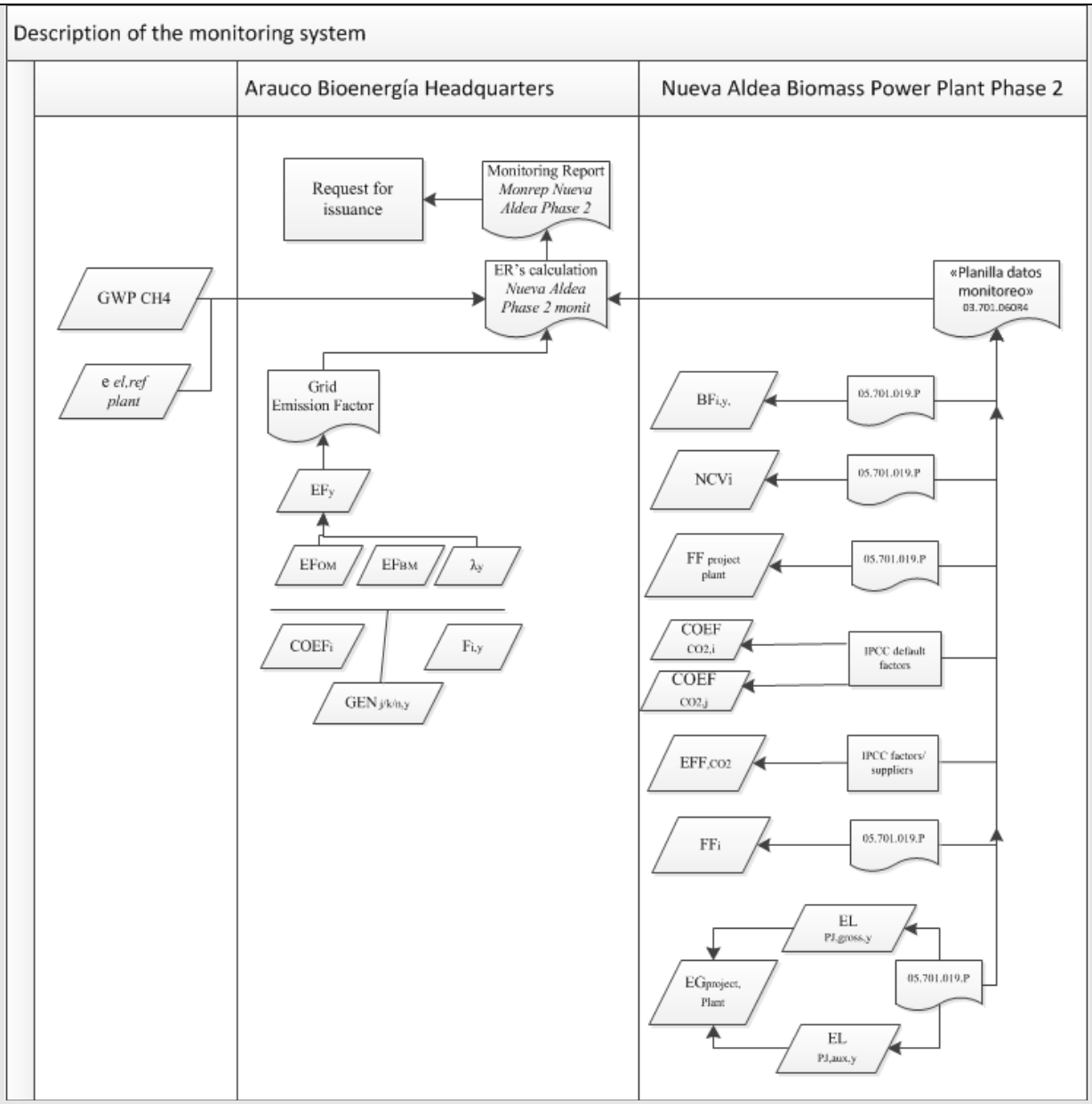
The Project Participant counts with on-site personnel (at the project activity site), who are in charge of gathering and registering all the information as per required in the monitoring plan. Such duties are incorporated to the personnel's everyday activities to ensure continuity and high-quality standards.

The monitoring parameters i.e. the quantity of biomass used, fossil fuel consumption and net quantity of electricity generated data, as can be seen from diagram below, are continuously monitored and collected by the Data Control System (DCS) and downloaded by the IP system automatically to an excel spread sheet. Then data collected is recorded daily and aggregated monthly as per required by the monitoring procedure.

The collected information is partially processed, validated and stored on-site by personnel. Then information is sent periodically i.e. monthly to Arauco Bioenergía S.A.(ex-Arauco Generación S.A.) in Santiago for further and final processing (table formats, reports, etc.).

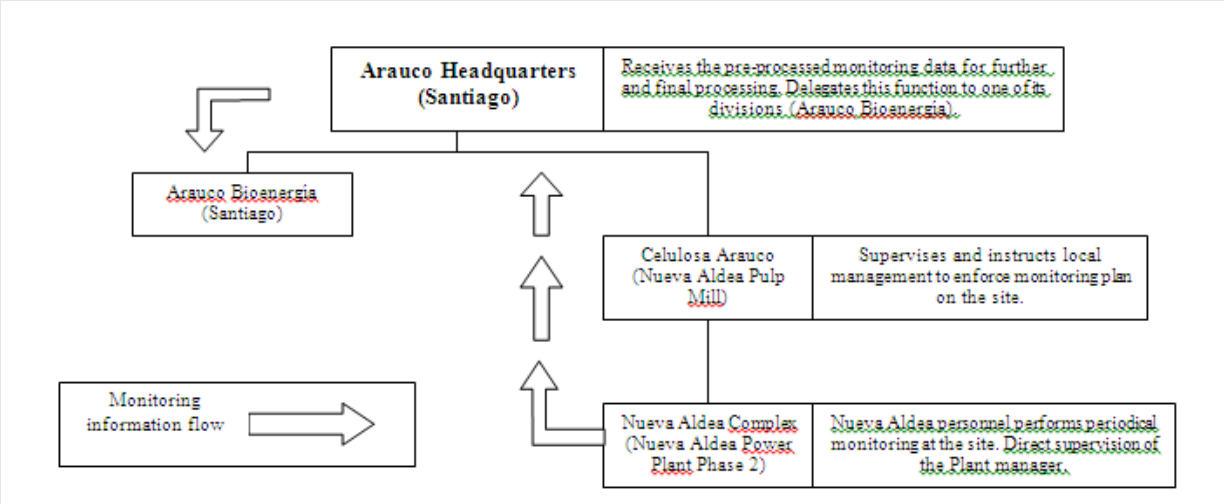
With the information at this level, the Project Participant is then in condition to verify the emission reduction of the Nueva Aldea Power Plant Phase 2 periodically i.e. once every year.

Diagram of the monitoring system used in this project activity:



Note that the procedure # 05.701.019 corresponds to the monitoring procedure of CDM parameters used in the emission reduction calculations

The shows the monitoring information flow implemented by Arauco Bioenergia S.A. for the project activity is presented in the following table:

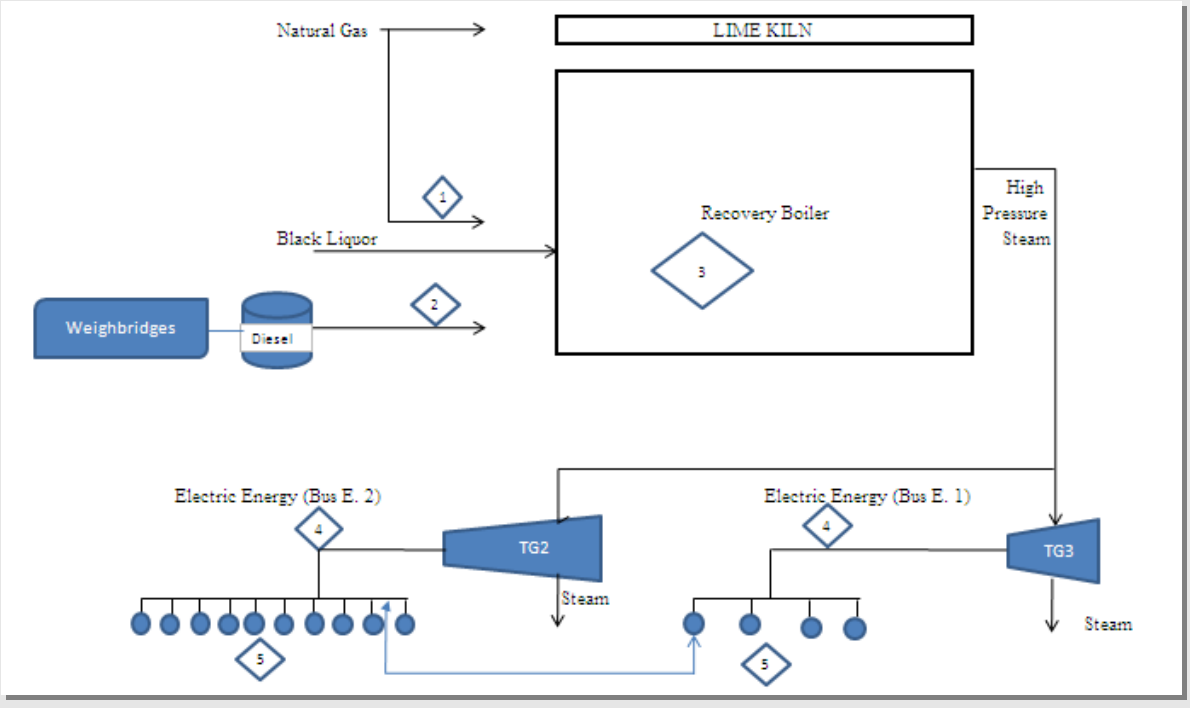


Relevant monitoring points and instruments of the monitoring plan:

Basically, the fuels (mainly black liquor) are combusted in the recovery boiler, where high pressure steam is produced and then transported to the turbines (TG2 and TG3). The turbines generate electricity (part of it goes to supply the pulp mill processes, and part goes to the grid) and steam (used internally, for pulp production).

The amount of fuels consumed in the recovery boiler and the electricity generated by the turbines are directly measured by the instruments that can be seen at the diagram and table below. The instruments are calibrated according to the specification of the manufacturer or proper industry standards and all the calibration certificates are saved electronically by Project Participant.

The relevant monitoring points, including the instruments used to measure the variables that are part of the monitoring plan are shown as follows:



Item	Instrument	
1	Natural Gas Meter (Start-up Burners) Natural Gas Meter (Load Burners)	
2	Diesel Meter (Start-up Burners) Return Diesel Meter (Start-up Burners) Diesel Meter (Load Burners) Return Diesel Meter (Load Burners)	
3	Black Liquor Flow Meter (Nozzle) 1-3 Black Liquor Flow Meter (Nozzle) 4-7 Black Liquor Flow Meter (Nozzle) 8-10 Black Liquor Flow Meter (Nozzle) 11-14 Refractometer Refractometer Black Liquor Temperature Transmitter	
4	Energy Meter Switchgear 1-2 Energy Meter Switchgear 2-5	(Bus E.1) gross electric generation (Bus E.2) gross electric generation
5	Energy Meter Switchgear 5-1 Energy Meter Switchgear 5-2A Energy Meter Switchgear 5-2B Energy Meter Switchgear 6-1 Energy Meter Switchgear 6-2A	Auxiliary consumption

Note: See Line diagram for detailed information.

(2012):

ITEM	INSTRUMENT	VARIABLE	TAG N°	MEASURED ERROR GREATER THAN ADMISSIBLE ERROR (YES/NO)	ADJUSTMENT MADE (YES / NO)
1	Natural Gas Meter (Start-up Burners)	$FF_{projectplant,i,y}$	552-FT-471	NO	NO
	Natural Gas Meter (Load Burners)	$FF_{projectplant,i,y}$	552-FT-483	NO	NO
2	Diesel Meter (Start-up Burners)	$FF_{projectplant,i,y}$	552-FT-663	NO	NO
	Return Diesel Meter (Start-up Burners)	$FF_{projectplant,i,y}$	552-FT-668	NO	NO
	Diesel Meter (Load Burners)	$FF_{projectplant,i,y}$	552-FT-671	NO	NO
	Return Diesel Meter (Load Burners)	$FF_{projectplant,i,y}$	552-FT-674	NO	NO
3	Black liquor flow transmitter (nozzles 1 - 3)	$BF_{i,y}$	552-FT-378	CALIBR NOT REQ	NO
	Black liquor flow transmitter (nozzles 4 - 7)	$BF_{i,y}$	552-FT-380	CALIBR NOT REQ	NO
	Black liquor flow transmitter (nozzles 8 - 10)	$BF_{i,y}$	552-FT-382	CALIBR NOT REQ	NO
	Black liquor flow transmitter (nozzles 11 - 14)	$BF_{i,y}$	552-FT-384	CALIBR NOT REQ	NO
	Refractometer	$BF_{i,y}$	552-DT-370-A	NO	NO
	Refractometer	$BF_{i,y}$	552-DT-370-B	NO	NO
	Temperature transmitter	$BF_{i,y}$	552-TI-365	NO	NO
4	Energy meter switchgear 1-2	$EG_{projectplant,y}$ / $EL_{PJ,gross,y}$	568-PML-12	NOT INSPECTED	NOT APPLICABLE
	Energy meter switchgear 2-5	$EG_{projectplant,y}$ / $EL_{PJ,gross,y}$	568-PML-25	NOT INSPECTED	NOT APPLICABLE
5	Energy meter switchgear 5-1	$EG_{projectplant,y}$ / $EL_{PJ,aux,y}$	568-PML-51	NOT INSPECTED	NOT APPLICABLE
	Energy meter switchgear 5-2A	$EG_{projectplant,y}$ / $EL_{PJ,aux,y}$	568-PML-52A	NOT INSPECTED	NOT APPLICABLE
	Energy meter switchgear 5-2B	$EG_{projectplant,y}$ / $EL_{PJ,aux,y}$	568-PML-52B	NOT INSPECTED	NOT APPLICABLE
	Energy meter switchgear 6-1	$EG_{projectplant,y}$ / $EL_{PJ,aux,y}$	568-PML-61	NOT INSPECTED	NOT APPLICABLE
	Energy meter switchgear 6-2A	$EG_{projectplant,y}$ / $EL_{PJ,aux,y}$	568-PML-62A	NOT INSPECTED	NOT APPLICABLE

Note that according to the manufacturer, energy meters from 568-PML-51 to 568-PML-62A require calibration every seven years. All of them were calibrated by the manufacturer in 2005. These instruments were replaced during 2011 and the new instruments were also calibrated by the manufacturer (See Section D. Data and Parameters, under parameter $EL_{PJ,aux,y}$).

(2011):

ITEM	INSTRUMENT	VARIABLE	TAG N°	MEASURED ERROR GREATER THAN ADMISSIBLE ERROR (YES/NO)	ADJUSTMENT MADE (YES / NO)
1	Natural Gas Meter (Start-up Burners)	$FF_{projectplant,i,y}$	552-FT-471	NO	NO
	Natural Gas Meter (Load Burners)	$FF_{projectplant,i,y}$	552-FT-483	NO	NO
2	Diesel Meter (Start-up Burners)	$FF_{projectplant,i,y}$	552-FT-663	NO	NO
	Return Diesel Meter (Start-up Burners)	$FF_{projectplant,i,y}$	552-FT-668	NO	NO
	Diesel Meter (Load Burners)	$FF_{projectplant,i,y}$	552-FT-671	NO	NO
	Return Diesel Meter (Load Burners)	$FF_{projectplant,i,y}$	552-FT-674	NO	NO
3	Black liquor flow transmitter (nozzles 1 - 3)	$BF_{i,y}$	552-FT-378	CALIBR NOT REQ	NO
	Black liquor flow transmitter (nozzles 4 - 7)	$BF_{i,y}$	552-FT-380	CALIBR NOT REQ	NO
	Black liquor flow transmitter (nozzles 8 - 10)	$BF_{i,y}$	552-FT-382	CALIBR NOT REQ	NO
	Black liquor flow transmitter (nozzles 11 - 14)	$BF_{i,y}$	552-FT-384	CALIBR NOT REQ	NO
	Refractometer	$BF_{i,y}$	552-DT-370-A	NO	NO
	Refractometer	$BF_{i,y}$	552-DT-370-B	NO	NO
	Temperature transmitter	$BF_{i,y}$	552-TI-365	ARE EQUAL	NO
4	Energy meter switchgear 1-2	$EG_{projectplant,y}$ / $EL_{PJ,gross,y}$	568-PML-12	NOT INSPECTED	NOT APPLICABLE
	Energy meter switchgear 2-5	$EG_{projectplant,y}$ / $EL_{PJ,gross,y}$	568-PML-25	NOT INSPECTED	NOT APPLICABLE
5	Energy meter switchgear 5-1	$EG_{projectplant,y}$ / $EL_{PJ,aux,y}$	568-PML-51	NOT INSPECTED	NOT APPLICABLE
	Energy meter switchgear 5-2A	$EG_{projectplant,y}$ / $EL_{PJ,aux,y}$	568-PML-52A	NOT INSPECTED	NOT APPLICABLE
	Energy meter switchgear 5-2B	$EG_{projectplant,y}$ / $EL_{PJ,aux,y}$	568-PML-52B	NOT INSPECTED	NOT APPLICABLE
	Energy meter switchgear 6-1	$EG_{projectplant,y}$ / $EL_{PJ,aux,y}$	568-PML-61	NOT INSPECTED	NOT APPLICABLE
	Energy meter switchgear 6-2A	$EG_{projectplant,y}$ / $EL_{PJ,aux,y}$	568-PML-62A	NOT INSPECTED	NOT APPLICABLE

Note that according to the manufacturer, energy meters from 568-PML-51 to 568-PML-62A require calibration every seven years. All of them were calibrated by the manufacturer in 2005. These instruments were replaced during 2011 and the new instruments were also calibrated by the manufacturer (See Section D. Data and Parameters, under parameter $EL_{PJ,aux,y}$).

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

(Copy this table for each piece of data and parameter.)

Data / Parameter:	$\varepsilon_{el,\ other\ plant(s)}$
Unit:	(%)
Description:	Average net energy efficiency of electricity generation in (the) other power plant(s) that would use the biomass fired in the project plant in the absence of the project activity.
Source of data:	The reference pulp mill's electric efficiency of 10.839% was calculated taking into account the following considerations: The chosen baseline scenario for the Nueva Aldea Phase 2 project activity that states that the reference pulp mill would be self-sufficient in electric and thermal power generation. This baseline scenario is consistent with the current BAT (Best Available Technology) for non-integrated bleached pulp mills, such as the Nueva Aldea Phase 2 pulp mill. The net electricity that would have been generated in the reference plant was determined by considering the gross electricity generated by the reference plant minus the corresponding auxiliary consumption. The corresponding values were obtained from the energy/mass balance of the reference plant.
Value(s) applied):	10.839%
Purpose of data:	Baseline emissions calculations.
Additional comment:	---

Data / Parameter:	GWP_{CH4}
Unit:	(t_{CO2e}/t_{CH4})
Description:	Global Warming Potential for CH4.
Source of data:	IPCC
Value(s) applied):	21 for the first commitment period. Shall be updated according to any future COP/MOP decisions.
Purpose of data:	Until the next COP/MOP decision, it is the accepted value for emission reduction calculations in CDM project activities.
Additional comment:	---

D.2. Data and parameters monitored

(Copy this table for each piece of data and parameter.)

Data / Parameter:	$BF_{i,y}$
Unit:	(tDS (tonnes dry solids))
Description:	Quantity of biomass type i used as fuel in the project plant during the year y in a volume or mass unit.
Measured/ Calculated / Default:	Measured

Source of data:	This variable was directly monitored using dedicated flow meters. The direct measurement of the % of dry solids and the temperature of the liquid biomass flow allow determining the flow of dry solids to the recovery boiler.
Value(s) of monitored parameter:	(2012) 1,465,417(tDS) (2011) 1,248,548(tDS)
Monitoring equipment:	552-FT-378 Type: Black Liquor Flow Meter (Nozzle) (1-3). ABB FSM 4000 Accuracy class: +/- 0.5% Serial number: 000402556/X001 Calibration frequency: According to manufacturer, calibration is not required for this instrument. Date of last calibration: 22/08/2005 *Instrument replaced on 14/08/2012 by:* 552-FT-378 Type: Black Liquor Flow Meter (Nozzle) (1-3). ABB FSM 4000 Accuracy class: +/- 0.5% Serial number: 00045089/X010 Calibration frequency: According to manufacturer, calibration is not required for this instrument. Date of last calibration: 16/06/2006 552-FT-380 Type: Black Liquor Flow Meter (Nozzle) (4-7.). ABB FSM 4000 Accuracy class: +/- 0.5% Serial number: 000402556/X003 Calibration frequency: According to manufacturer, calibration is not required for this instrument. Date of last calibration: 19/08/2005 552-FT-382 Type: Black Liquor Flow Meter (Nozzle) (8-10). ABB FSM 4000 Accuracy class: +/- 0.5% Serial number: 000402556/X002 Calibration frequency: According to manufacturer, calibration is not required for this instrument. Date of last calibration: 22/08/2005 552-FT-384 Type: Black Liquor Flow Meter (Nozzle) (11-14). ABB FSM 4000 Accuracy class: +/- 0.5% Serial number: 000402556/X004 Calibration frequency: According to manufacturer, calibration is not required for this instrument. Date of last calibration: 19/08/2005 552-DT-370-A Type: Refractometer K-Patents PR-01-S Accuracy class: +/- 0.1%DS Serial number: 2005B16-6232 Calibration frequency: 2 years Calibration dates: 23/03/2010, 20/08/2011 Date of last calibration: 24/08/2012 Validity: 24/08/2014

<table>
<tr><td></td><td>552-DT-370-B
Type: Refractometer K-Patents PR-01-S
Accuracy class: +/- 0.1%DS
Serial number: 2005B17-6233
Calibration frequency: 2 years
Calibration dates: 23/03/2010, 20/08/2011
Date of last calibration: 24/08/2012
Validity: 24/08/2014

552-TI-365
Type: Black Liquor Temperature Transmitter Rosemount 3144PD1A1NAB4C4Q4
Accuracy class: +/- 0.1℃
Serial number: 494356
Calibration frequency: 5 years
Calibration dates: 27/03/2010, 05/05/2011
Date of last calibration: 14/08/2012
Validity: 14/08/2017</td></tr>
<tr><td>Measuring/ Reading/ Recording frequency:</td><td>The measurement is done continuously (each five seconds), online and fully integrated with the Distributed Control System (DCS) of the pulp mill. Data of biomass consumption is aggregated and recorded monthly for emission reduction calculation</td></tr>
<tr><td>Calculation method (if applicable):</td><td>Not applicable</td></tr>
<tr><td>QA/QC procedures:</td><td>All instruments received proper maintenance and calibration according to manufacturer’s specification.

In addition, biomass flows of black liquor burnt in the boiler were cross-checked with flow variations. The amount of black liquor burnt was cross checked against the difference obtained between the total measurements of black liquor flows to the recovery boiler and measurements of the returned flows of black liquor not burnt in the boiler.

The annual difference between both measurements was 0.8% for CP1MP6 and 0.6 % for CP1MP5. Therefore, black liquor flow measurements were deemed consistent.

<table>
<tr><th>Year</th><th>Black liquor flow (tDS/y)</th><th>Black liquor flow check (tDS/y)</th><th>% Difference</th></tr>
<tr><td>2012</td><td>1,465,417</td><td>1,476,518</td><td>0.8%</td></tr>
<tr><td>2011</td><td>1,248,548</td><td>1,255,893</td><td>0.6%</td></tr>
</table>

Also, the Project Participant performed an energy / mass balance of the biomass power plant that considered the biomass (black liquor in tDS) burned in the recovery boiler, the heat and the electric power generation during the monitored period. The efficiency obtained for the recovery boiler was 63.40% for CP1MP6 and 59.19% for CP1MP5, which are consistent when compared with the value of 62.11% informed by the manufacturer.</td></tr>
<tr><td>Purpose of data:</td><td>Baseline emissions calculations</td></tr>
<tr><td>Additional comment:</td><td>---</td></tr>
</table>

Data / Parameter:	NCV_i
Unit:	(GJ/ tDS (tonnes dry solids))
Description:	Net calorific value of biomass type I per mass or volume of biomass.
Measured/ Calculated / Default:	Measured.
Source of data:	The Project Participant used the following information sources to determine this parameter: This variable was measured in a specialized and reputed laboratory, according to proper industry standards. Measurement is performed on dry basis
Value(s) of monitored parameter:	
Monitoring equipment:	Not applicable.
Measuring/ Reading/ Recording frequency:	Annually.
Calculation method (if applicable):	According to ACM0006 (Version 2) and to the approved revised monitoring plan, measurement of NCV must be taken once a year. The annual values, which were measured in a specialized and reputed laboratory, are considered representative for the whole monitoring period because raw material composition (i.e. wood from pine and eucalyptus) used to make pulp, from which the black liquor is generated, remained stable along both monitoring periods. As shown in the following table, pulp from pine and eucalyptus was produced in approximately equal amounts

Year	Date of Sample	(GJ/tDS) or (MWh/tDS)
2012	16/04/2012	10.70 (GJ/tDS) equiv. to 2.55 (MWh/tDS)
2011	31/03/2011	10.70 (GJ/tDS) equiv. to 2.55 (MWh/tDS)

Year	Share of pulp mill Production from Pine.	Share of pulp mill Production from Eucalyptus.	Total Pulp mill Production
	(% of ADT)	(% of ADT)	(ADT/yr)
2012	48.4	51.6	882,345
2011	48.1	51.9	792,689

Note that ADT stands for “Air dry tons” used of pulp pricing.

QA/QC procedures:	The measured net calorific value of the biomass (black liquor) was consistent with the net calorific values found for Sulphite Lyes (black liquor) in Table 1.2, Volume 2 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Source	NCV (GJ / tDS)	NCV (MWh / tDS)
Value applied (2012)	10.70	2.55
Value applied (2011)	10.70	2.55
Default values IPCC 2006, Chapter 1, Volume 2.	Average:11.8	Average:3.2
	Range [5.9–23.0]	Range [1.64-6.39]
Historical value 2010	10.29	2.86
Historical value 2009	10.35	2.87
Historical value 2008	9.78	2.72
Historical value 2007	9.37	2.60

Purpose of data:	Baseline emission calculations
Additional comment:	---

Data / Parameter:	$COEF_{CO2,i}$
Unit:	Diesel: (tCO_2/000ton) Fuel Oil(tCO2/000ton) Natural Gas: (tCO_2/MMm^3)
Description:	CO_2 emission factor of the fossil fuel type i used in the project plant.
Measured/ Calculated / Default:	This coefficient is calculated based on net calorific value and the weighted average CO_2 emission factor of the fuel type i, as shown below.
Source of data:	The Project Participant used the following sources to determine this parameter: – Fossil fuel net calorific value: Fossil fuel laboratory analysis. – Fossil fuel carbon content: 2006 IPCC Guidelines for National Greenhouse gas Inventories, Volume 2, Table 1-4. Fossil fuel fraction of carbon oxidized: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Table 1-4.

Value(s) of monitored parameter:	2012: Diesel: 3,170 (tCO_2/000ton) Fuel Oil: 3,109(tCO_2/000ton) Natural Gas: 2,007 (tCO^2/MMm^3) 2011: Diesel: 3,174 (tCO_2/000ton) Fuel Oil: 3,109(tCO_2/000ton) Natural Gas: 2,081 (tCO_2/MMm^3)
Monitoring equipment:	Not Applicable.
Measuring/ Reading/ Recording frequency:	Annually.
Calculation method (if applicable):	These emission factors were determined in accordance to Option B of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" using the net calorific value ($NCV_{i,y}$) and the CO_2 emission factor of each fossil fuel i. ($EF_{CO2,i,y}$). $COEF_{CO2,Diesel}(tCO_2/000ton) = NCV_{Diesel,y}$ [TJ/000ton] *$EF_{CO2,\ Diesel,y}$ [tCO_2/GJ] $COEF_{CO2,FO}(tCO_2/000ton) = NCV_{FO,y}$ [TJ/000ton] *$EF_{CO2,\ FO,y}$ [tCO_2/GJ] $COEF_{CO2,Natural\ gas}(tCO_2/000ton)= NCV_{Natural\ gas,y}$ [TJ/ton] *$EF_{CO2,\ Natural\ gas,y}$ [tCO_2/TJ]. Where the emission factor for each fossil fuel i is determined as follows: $EF_{CO2,i,y}$ (tCO_2/GJ) = [Carbon content of fossil i (tC/TJ)* Fraction of carbon oxidized * CO_2 / C conversion factor [tCO_2/tC].] (1GJ/1,000TJ) Note that the Project Participant presents local measurements of Net calorific values in Tera-joules per thousand tons (TJ/000tons) to cross-check measurements with IPCC values published in units of (TJ/Gg) equivalent to (TJ/000tons). This explain why the Project Participant uses the $COEF_{CO2,i}$ in units of tons of CO_2 per thousand tons (tCO_2/000ton), as can be seen from equations presented above.
QA/QC procedures:	The Project Participant used the most updated IPCC default factors to calculate the fossil fuel coefficients. In this case, values were obtained from 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Table 1-4. Net calorific values for Diesel, Fuel Oil and natural gas (the three fossil fuels consumed in 2011 and 2012) were obtained from their respective suppliers during the first semester of each year. This information was compared with the values published in Table 1-2 of the 2006 IPCC Guidelines for National Greenhouse gas Inventories, Volume 2. Fossil fuel of type Diesel:

Source	NCV (TJ/ 000 ton)
Value applied	(2012):42.80 (2011):42.85
Default values IPCC 2006, Chapter 1, Volume 2.	Average:43.0 Range [41.4 – 43.3]
Historical value 2010.	42.9.

Historical value 2009.	42.9
Historical value 2008.	45.5
Historical value 2007	42.9

Fossil fuel of type Fuel Oil:

Source	NCV (TJ/ 000 ton)
Value applied	(2012):40.40 (2011):40.79
Default values IPCC 2006, Chapter 1, Volume 2.	Average:43.0 Range [41.4 – 43.3]
Historical value 2010.(Other CDM project Ref:1787)	(1st SEM)40.74 (2nd SEM)40.60
Historical value 2009 (Other CDM project Ref:1787)	(1st SEM)41.0 (2nd SEM)40.87

Note that this is the first time the plant used FO.As a result, the values applied are cross-check with values obtained from other CDM plant.

Fossil fuel of type Natural gas:

Source	NCV (TJ/ 000 ton)
Value applied.	(2012):49.35 (2011):46.96
Default values IPCC 2006, Chapter 1, Volume 2.	Average:48.0 Range [46.5 – 50.4]
Historical value 2010.	46.9
Historical value 2009.	46.30
Historical value 2008.	46.58
Historical value 2007	47.14

According to the values above, the Project Participant deemed the monitored NCV values within the acceptable ranges.

Purpose of data:	Project emissions.
Additional comment:	---

Data / Parameter:	$FF_{project\ plant,i,y}$
Unit:	Diesel: (ton) Fuel Oil: (ton) Natural Gas: (ton)
Description :	On-site fossil fuel consumption of fuel type i for co-firing in the project plant.
Measured/ Calculated	Measured.

/ Default:	
Source of data:	The Project Participant used the following source to determine this parameter: Fossil fuel used in the recovery boiler attributable to the project activity. Fossil fuel quantities must only be accounted when the power plant is generating surplus power to the grid and the pulp mill is not under a start-up operation process. Fossil fuel amounts are directly monitored by the power plant operators in Nueva Aldea Phase 2 biomass power plant For additional information see section D.2.1.1. (Page 6) of the revised monitoring plan.
Value(s) of monitored parameter:	(2012): Diesel: 831(ton) Fuel Oil:1,206(ton) Natural Gas: 0(ton) (2011): Diesel: 2,609(ton) Fuel Oil:0.89(ton) Natural Gas: 0(ton)
Monitoring equipment:	552-FT-663 Type: Diesel Meter (Start-up Burners) ENDRESS & HAUSER Promass 83 F DN25 / 1” Accuracy class: +/- 0.1% Serial number: 75044102000 Calibration frequency: 5 years Date of penultimate calibration: 09/06/2005 Date of last calibration: 31/03/2010 Validity: 30/03/2015 552-FT-668 Type: Return Diesel Meter (Start-up Burners) ENDRESS & HAUSER Promass 83 F DN15 / ½” Accuracy class: +/- 0.1% Serial number: 75043E02000 Calibration frequency: 5 years Date of penultimate calibration: 08/06/2005 Date of last calibration: 30/03/2010 Validity: 29/03/2015 552-FT-671 Type: Diesel Meter (Load Burners) ENDRESS & HAUSER Promass 83 F DN25 / 1” Accuracy class: +/- 0.1% Serial number: 75044202000 Calibration frequency: 5 years Date of penultimate calibration: 09/06/2005 Date of last calibration: 31/03/2010 Validity: 30/03/2015 552-FT-674 Type: Return Diesel Meter (Load Burners) ENDRESS & HAUSER Promass 83 F DN15 / ½” Accuracy class: +/- 0.1% Serial number: 75043F02000 Calibration frequency: 5 years Date of penultimate calibration: 08/06/2005 Date of last calibration: 30/03/2010 Validity: 29/03/2015

	552-FT-471 Type: Natural Gas Meter (Start-up Burners) ENDRESS & HAUSER Promass 83 F DN100 / 4” Accuracy class: +/- 0.5% Serial number: 75044302000 Calibration frequency: 5 years Date of penultimate calibration: 07/06/2005 Date of last calibration: 01/04/2010 Validity: 31/03/2015 552-FT-483 Type: Natural Gas Meter (Load Burners) ENDRESS & HAUSER Promass 83 F DN100 / 4” Accuracy class: +/- 0.5% Serial number: 75044402000 Calibration frequency: 5 years Date of penultimate calibration: 07/06/2005 Date of last calibration: 31/03/2010 Validity: 30/03/2015
Measuring/ Reading/ Recording frequency:	The measurement of fossil fuels is online and fully integrated with the Distributed Control System (DCS) of the pulp mill. Fossil fuel consumption is measured in tonnes and totalized three (3) times/day (one record per shift), and then aggregated and recorded monthly in the emission reduction sheet.
Calculation method (if applicable):	Not applicable.
QA/QC procedures:	Fuel meters received periodic maintenance and calibration as instructed by the equipment manufacturer and according to proper industry standards. According to methodology, the consistency of metered fuel consumption shall be checked with purchase receipts, whenever possible and available. The measurements of Diesel in the plant under normal operation were cross-checked with purchase receipts. Results are presented in the table below:

Year	Diesel purchase receipts (ton/y)	Diesel consumption in the recovery boiler (ton/y)	% Difference
2012	1,097	831	32.0%(See note below)
2011	2,688	2,609	3.0%

Note: As it is shown in table above differences between measured value of Diesel fuel and purchase receipts values were over the control (+/-10%), as a result, this event was notified to the chief of liquor to perform a review to the instruments. This was done and no problem was found with the instruments. In order to address this problem, the Project Participant will perform and adjustments, if necessary, to the monitored (measured) value to guarantee conservativeness in the emission reduction calculations.

The measurements of FO in the plant contemplating the consumption in the recovery boiler and in the lime kiln under normal operation were cross-checked with purchase receipts. Results presented in the table below for both years are considered reasonable values.

	<table><tr><th>Year</th><th>FO purchase receipts (ton/y)</th><th>FO consumption in the recovery boiler (ton/y)</th><th>Lime kiln consumption</th><th>% Difference</th></tr><tr><td>2012</td><td>33,393</td><td>1,206</td><td>33,088</td><td>2,7%</td></tr><tr><td>2011</td><td>8,610</td><td>0.247</td><td>9,103</td><td>5.4%</td></tr></table> For Natural gas, a similar comparison to that established for Diesel and Fuel Oil was carried out, however, in this case there were no consumption of natural gas, as it is shown in table below: Gas consumption on normal operation days: <table><tr><th>Year</th><th>Gas supplier meter reading (ton/y)</th><th>Recovery boiler consumption (ton/y)</th><th>%Difference</th></tr><tr><td>2012</td><td>0.0</td><td>0.0</td><td>n/a</td></tr><tr><td>2011</td><td>0.0</td><td>0.0</td><td>n/a</td></tr></table>
Purpose of data:	Project emissions.
Additional comment:	---

Data / Parameter:	$EG_{project\ plant,y}$
Unit:	(MWh)
Description:	Net quantity of electricity generated in the project plant during the year y.
Measured/ Calculated / Default:	Calculated.
Source of data:	The Project Participant used the following information to determine this parameter: ~ Nueva Aldea Phase 2 power plant on line direct measurements of the gross electric power generated in the power plant. Measurements are continuously stored in the DCS database system (See note below). ~ Nueva Aldea Phase 2 power plant on line direct measurements of the total auxiliary electricity consumption. Measurements are continuously stored in the DCS database system of the power plant (See note below). Note that the gross quantity of electricity generation and total auxiliary electricity consumption are named using the nomenclature defined in the ACM0006 (Version 11.0.1). (For additional information see the revised monitoring plan, page 11).
Value(s) of monitored parameter:	(2012): 511,582 (MWh) (2011): 501,045 (MWh)
Monitoring equipment:	– Gross quantity of electricity generated in the project plant : Refer to monitoring equipment presented in the table for parameter – Total auxiliary electricity consumption: Refer to the monitoring equipment presented in the table for $EL_{PJ,aux,y}$

Measuring/ Reading/ Recording frequency:	The gross electricity generated and total auxiliary electricity consumption of the project plant was continuously measured using dedicated energy meters. Measurements obtained were recorded in the DCS database system every two minutes and aggregated and registered monthly for the emission calculation of the monitored period.
Calculation method (if applicable):	In accordance with criteria used in more recent version of the ACM0006 baseline methodology and following the indications of the revised monitoring plan the net quantity of electricity generated was determined from the difference between the monitored amount of gross electricity generated and the monitored amount of total auxiliary electricity consumption, as it is shown as follows: $EG_{project\ plant} = EL_{PJ,gross,y} - EL_{PJ,aux,y}$ where: $EL_{PJ,gross,y}$: Parameter obtained from on-site measurement using proper and dedicated electricity meters. $EL_{PJ,aux,y}$: Parameter obtained from on-site measurement using proper and dedicated electricity meters. Note that the parameter $EL_{PJ,aux,y}$ include the electricity required for the operation of all power plants which are located at the project site and included in the project boundary (e.g. pumps, fans, instrumentation and control, etc...)
QA/QC procedures:	According to methodology ACM0006 (version 2), the consistency of metered net electricity generation was cross-checked using an efficiency index (electricity generation divided by the quantity of biomass fired). As can be seen in the following table, values obtained for 2012 and 2011 were relative low compared with previously years and with the theoretical calculation. This can partially be explained because of the low amount of electricity generated due to the turbo generator (TG3) was out-of service from September to December in 2011 and from January to April in 2012.

	Real	Theoretical
Index	(MWh/tDS)	(MWh/tDS)
2012	0.40	0.51
2011	0.45	0.51
2010	0,50	0,51
2009	0,49	0,51
2008	0,51	0,51
2007	0,43	0,51

	The theoretical index is based on the generation of 61.4 MW by the first turbine (TG2) and 31.9 MW by the second turbine (TG3). All electricity meters received periodic maintenance and calibration as instructed by the equipment manufacturer and according to proper industry standards.
Purpose of data:	Baseline emission calculations.
Additional comment:	---

Data / Parameter:	$EL_{PJ,gross,y}$
Unit:	(MWh)
Description:	Gross quantity of electricity generated in all power plants which are located at the project site and included in the project boundary in year.
Measured/ Calculated / Default:	Measured.
Source of data:	The Project Participant used the following information to determine this parameter: Nueva Aldea Phase 2 power plant on line direct measurements of the gross electricity generated in Nueva Aldea Phase 2 biomass power plant. Measurements are continuously stored in the DCS database system.
Value(s) of monitored parameter:	(2012): 593,450 (MWh) (2011): 562,799 (MWh)

Monitoring equipment:	568-PML-12 Type: Energy Meter Switchgear (1-2) Power Measurement ION 7330 Accuracy class: +/- 0.5% Serial number: PB-0502A 108-11 Calibration frequency: 7 years Date of last calibration: 08/02/2005 Validity: 07/02/2012 *Instrument replaced on 27/12/2011 by:* 568-PML-12 Type: Energy Meter Switchgear (1-2) Power Measurement ION 7330 Accuracy class: +/- 0.5% Serial number: PB-1108A449-11 Calibration frequency: 7 years Date of first calibration: 25/08/2011 Validity: 24/08/2018 568-PML-25 Type: Energy Meter Switchgear (2-5) Power Measurement ION 7330 Accuracy class: +/- 0.5% Serial number: PB-0502A245-11 Calibration frequency: 7 years Date of first calibration: 14/02/2005 Validity: 13/02/2012 *Instrument replaced on 16/09/2011 by:* 568-PML-25 Type: Energy Meter Switchgear (2-5) Power Measurement ION 7330 Accuracy class: +/- 0.5% Serial number: PB-1001A347-11 Calibration frequency: 7 years Date of first calibration: 22/01/2010 Validity: 21/01/2017
Measuring/ Reading/ Recording frequency:	The gross electricity generated of the Nueva Aldea Phase 2 biomass power plant was continuously measured using dedicated energy meters. Measurements were recorded in the DCS database system every two minutes and aggregated and registered monthly for the emission calculation of the monitored period.
Calculation method (if applicable):	Not applicable.
QA/QC procedures:	All electricity meters received periodic maintenance and calibration as per instructed by the equipment manufacturer and according to proper industry standards.
Purpose of data:	Baseline emissions calculations.
Additional comment:	---

Data / Parameter:	$EL_{PJ,aux,y}$
Unit:	(MWh)

Description:	Total auxiliary electricity consumption required for the operation of the power plants at the project site in year y (MWh).
Measured/ Calculated / Default:	Measured.
Source of data:	The Project Participant used the following information to determine this parameter: Nueva Aldea Phase 2 power plant on line direct measurements of the total auxiliary electricity consumption in Nueva Aldea Phase 2 biomass power plant. Measurements are continuously stored in the DCS database system.
Value(s) of monitored parameter:	(2012): 81,869 (MWh) (2011): 61,753 (MWh)
Monitoring equipment:	568-PML-51 Type: Energy Meter Switchgear (5-1) Power Measurement ION 7330 Accuracy class: +/- 0.5% Serial number: PB-0412A453-11 Calibration frequency: 7 years Date of first calibration: 04/01/2005 Validity: 03/01/2012 *Instrument replaced on 27/12/2011 by:* 568-PML-51 Type: Energy Meter Switchgear (5-1) Power Measurement ION 7330 Accuracy class: +/- 0.5% Serial number: PB-1108A602-11 Calibration frequency: 7 years Date of first calibration: 01/09/2011 Validity: 31/08/2018 568-PML-52A Type: Energy Meter Switchgear (5-2A) Power Measurement ION 7330 Accuracy class: +/- 0.5% Serial number: PB-0501A419-11 Calibration frequency: 7 years Date of first calibration: 24/01/2005 Validity: 23/01/2012 I*nstrument replaced on 27/12/2011 by:* 568-PML-52A Type: Energy Meter Switchgear (5-2A) Power Measurement ION 7330 Accuracy class: +/- 0.5% Serial number: PB-1108A463-11 Calibration frequency: 7 years Date of first calibration: 27/08/2011 Validity: 26/08/2018 568-PML-52B Type: Energy Meter Switchgear (5-2B) Power Measurement ION 7330 Accuracy class: +/- 0.5% Serial number: PB-0501A006-11 Calibration frequency: 7 years Date of first calibration: 05/01/2005 Validity: 04/01/2012

	Instrument replaced on 03/01/2012 by: 568-PML-52B Type: Energy Meter Switchgear (5-2B) Power Measurement ION 7330 Accuracy class: +/- 0.5% Serial number: PB-1108A470-11 Calibration frequency: 7 years Date of first calibration: 27/08/2011 Validity: 26/08/2018 568-PML-61 Type: Energy Meter Switchgear (2-5) Power Measurement ION 7330 Accuracy class: +/- 0.5% Serial number: PB-0501A503-11 Calibration frequency: 7 years Date of first calibration: 26/01/2005 Validity: 25/01/2012 *Instrument replaced on 27/12/2011 by:* 568-PML-61 Type: Energy Meter Switchgear (2-5) Power Measurement ION 7330 Accuracy class: +/- 0.5% Serial number: PB-1108A595-11 Calibration frequency: 7 years Date of first calibration: 01/09/2011 Validity: 31/08/2018 568-PML-62A Type: Energy Meter Switchgear (2-5) Power Measurement ION 7330 Accuracy class: +/- 0.5% Serial number: PB-0501A033-11 Calibration frequency: 7 years Date of first calibration: 05/01/2005 Validity: 04/01/2012 *Instrument replaced on 27/12/2011 by:* 568-PML-62A Type: Energy Meter Switchgear (2-5) Power Measurement ION 7330 Accuracy class: +/- 0.5% Serial number: PB-1108A462-11 Calibration frequency: 7 years Date of first calibration: 26/08/2011 Validity: 25/08/2018
Measuring/ Reading/ Recording frequency:	The total auxiliary electricity consumption of the Nueva Aldea Phase 2 biomass power plant was continuously measured using dedicated energy meters. Measurements were recorded in the DCS database system every two minutes and aggregated and registered monthly for the emission calculation of the monitored period.
Calculation method (if applicable):	Not applicable.
QA/QC procedures:	All electricity meters received periodic maintenance and calibration as per instructed by the equipment manufacturer and according to proper industry standards.

Purpose of data:	Baseline emission calculations.
Additional comment:	---

Data / Parameter:	EF_y
Unit:	(tCO_2/MWh)
Description:	CO_2 emission factor of the grid.
Measured/ Calculated / Default:	Calculated.
Source of data:	The project Participant used the following information sources to determine this parameter: ~ CDEC SIC Dispatch Centre reports. ~ Ministry of Energy reports. ~ 2006 IPCC lower values.
Value(s) of monitored para□eter:	(2012): 0.7268 (tCO_2/MWh) (2011): 0.7187 (tCO_2□MWh)
Monitoring equipment:	Not Applicable.
Measuring/ Reading/ □□cording frequency:	Annually.
Calculation method (if applicable):	Calculated as a weighted sum of the OM and BM emission factors, according to equation 10 of the ACM0002 (Version 4). All the information required for the calculation of this emission factor is in the Annex of this Monitoring Report.
QA/QC procedures:	As mentioned in the PDD, the quality control of this data is beyond the control of the project operator.
Purpose of data:	Baseline emission calculations.
Additional comment:	---

Data / Parameter:	$EF_{OM,y}$
Unit:	(tCO_2/MWh)
Description:	CO_2 Operating Margin emission factor of the grid

Measured/ Calculated / Default:	Calculated.
Source of data:	The project Participant used the following information sources to determine this parameter: ~ CDEC SIC Dispatch Centre reports. ~ Ministry of Energy reports. ~ 2006 IPCC lower values.
Value(s) of monitored parameter:	(2012): 0.6950(tCO_2/MWh) (2011): 0.7325(tCO_2/MWh)
Monitoring equipment:	Not Applicable.
Measuring/ Reading/ Recording fre□ue□cy:	Annually.
Ca□culation method (if applicable):	In this case, the OM emission factor is calculated using the simple/adjusted method equation, N°4 of the ACM0002 (Version 04), according the simple adjusted OM method. The justification for the chosen OM calculation method is presented in detail in page 47 of the registered PDD. All the information required for the calculation of this emission factor is in the Annex of this Monitoring Report.
QA/QC procedures:	As mentioned in the PDD, the quality control of this data is beyond the control of the project operator.
Purpose of data:	Baseline emission calculations.
Additional comment:	---

Data / Parameter:	$EF_{BM,y}$
Unit:	(tCO_2/MWh)
Description:	CO_2 Build Margin emission factor of the grid.
Measured/ Calculated / Default:	Calculated.
Source of data:	Relevant dispatch center, electric power companies' public information, host country government official information and IPPC.
Value(s) of monitored parameter:	(2012): 0.7585(tCO_2/MWh) (2011): 0.7048(tCO_2/MWh)
Monitoring equipment:	Not Applicable.

Measuring/ Reading/ Recording frequency:	Annually.
Calculation method (if applicable):	This variable is calculated using equation N°9 of the ACM0002 (Version 04). In this case, the BM was calculated for each year (ex-post). All the information required for the calculation of this emission factor is in the Annex of this Monitoring Report.
QA/QC procedures:	As mentioned in the PDD, the quality control of this data is beyond the control of the project operator.
Purpose of data:	Baseline emission calculations.
Additional comment:	---

Data / Parameter:	$F_{i,y}$
Unit:	For Liquid Natural Gas (LNG) (MMm^3 – std/yr) For Natural Gas (MMm^3 – std/yr) For Diesel (000' ton/yr) For IFO 180 (000' ton/yr) For Coal (000' ton/yr) For Petcoke (000' ton/yr) Note that the amount fossil fuel consumed by each power source is presented in units of thousand tons per year (000 ton/yr) for the grid emission factor calculation considering that the CO_2 emission coefficient of each fuel type i (COEFi) is expressed in units of tons of CO_2 per thousand tons (tCO_2/000ton).
Description:	Amount of each fossil fuel consumed by each power source / plant.
Measured/ Calculated / Default:	Measured.
Source of data:	The project Participant used the following information sources to determine this parameter: ~ CDEC SIC Dispatch Centre reports. ~ Ministry of Energy reports.
Value(s) of monitored parameter:	Refer to the emission factor calculation excel sheet.
Monitoring equipment:	Not applicable.
Measuring/ Reading/ Recording frequency:	Annually.
Calculation method (if applicable):	Not applicable.
QA/QC procedures:	As mentioned in the PDD, the quality control of this data is beyond the control of the project operator.
Purpose of data:	Baseline emission calculations.
Additional comment:	---

Data / Parameter:	$COEF_i$
Unit:	Units in (tCO_2/000ton) except Nat. Gas (tCO_2/MMm^3)
Description:	CO_2 emission coefficient of each fuel type i consumed by the electric power generators in the relevant grid.
Measured/ Calculated / Default:	Calculated.
Source of data:	This factor was calculated using 2006IPCC default values (Carbon content and fraction of carbon oxidized) and local national data (Net calorific values of the corresponding fossil fuels).
Value(s) of monitored parameter:	Coal: 2,673 (tCO_2/000ton) Pet coke: 2,714 (tCO_2/000ton) Diesel: 3,209 (tCO_2/000ton) Nat. Gas: 1,973 (tCO_2/MMm^3) IFO 180: 3,231 (tCO_2/000ton) Butane Gas: 1,608 (tCO_2/000ton) Propane Gas: 1,608 (tCO_2/000ton) Natural Gas Liquid: 1,973 (tCO_2/MMm^3)
Monitoring equipment:	Not applicable.
Measuring/ Reading/ Recording frequency:	Annually.
Calculation method (if applicable):	$COEF_{CO2,i}$ (tCO_2/000ton)= NCV_i (TJ/000ton)*Carbon content of fuel type i (tC/TJ)* CO_2 / C conversion factor (tCO_2/tC). Note that the Project Participant presents local measurements of Net calorific values in Tera joules per thousand tons (TJ/000tons) to cross-check measurements with IPCC values published in units of (TJ/Gg) equivalent to (TJ/000tons). This explain why the Project Participant express the parameter $COEF_{CO2,i}$ in units of tons of CO_2 per thousand tons (tCO_2/000ton), as it is shown in equation above.
QA/QC procedures:	Local NCV were duly compared with IPCC default values and/or lower values. Local values were found consistent. Carbon content and % of carbon oxidized were taken from the IPCC.
Purpose of data:	Baseline emission calculations.
Additional comment:	---

Data / Parameter:	$GEN_{j/k/n,y}$
Unit:	(MWh/yr) Refer to the emission factor calculation.
Description:	Electricity generation of each power source / plant j/k or n.
Measured/ Calculated / Default:	Measured.
Source of data:	This information was directly obtained by the CDEC-SIC Dispatch Center.
Value(s) of monitored parameter:	Refer to the emission factor calculation excel sheet.

Monitoring equipment:	Not applicable.
Measuring/ Reading/ Recording frequency:	Annually.
Calculation method (if applicable):	Not applicable.
QA/QC procedures:	The Project Participant calculated this emission coefficient from official and publicly available data from the CDEC-SIC Dispatch Centre.
Purpose of data:	Baseline emission calculations.
Additional comment:	---

Data / Parameter:	**--**
Unit:	Text
Description:	Identification of power source / plant for the OM calculation.
Measured/ Calculated / Default:	Determined based on official data
Source of data:	This information was directly obtained by the CDEC-SIC Dispatch Center.
Value(s) of monitored parameter:	Refer to the emission factor calculation excel sheet.
Monitoring equipment:	Not applicable.
Measuring/ Reading/ Recording frequency:	Annually.
Calculation method (if applicable):	Not applicable.
QA/QC procedures:	Not applicable. This information comes from official sources.
Purpose of data:	Baseline emission calculations.
Additional comment:	---

Data / Parameter:	**--**
Unit:	Text
Description:	Identification of power source / plant for the BM calculation.
Measured/ Calculated / Default:	Determined based on official data.
Source of data:	This information was directly obtained by the CDEC-SIC Dispatch Center.
Value(s) of monitored parameter:	Refer to the emission factor calculation excel sheet.
Monitoring equipment:	Not Applicable.

Measuring/ Reading/ Recording frequency:	Annually.
Calculation method (if applicable):	Not applicable.
QA/QC procedures:	Not applicable. This information comes from official sources.
Purpose of data:	Baseline emission calculations.
Additional comment:	---

Data / Parameter:	λ_y
Unit:	Number
Description:	Fraction of time during which low-cost / must-run sources are on the margin.
Measured/ Calculated / Default:	Calculated.
Source of data:	This factor was calculated from information directly obtained from the CDEC-SIC Dispatch Center.
Value(s) of monitored parameter:	(2012): λ_{2012} = 0.000000000 (2011): λ_{2011} =0.0001141553
Monitoring equipment:	Not Applicable.
Measuring/ Reading/ Recording frequency:	Annually.
Calculation method (if applicable):	As per the corresponding methodology (ACM0002) (Version 04)
QA/QC procedures:	The data used for the calculation of this parameter comes from official sources. The calculation was double-checked in this case.
Purpose of data:	Baseline emission calculations.
Additional comment:	---

Data / Parameter:	$GEN_{j/k/ll,y\ IMPORTS}$
Unit:	(KWh)
Description:	Electricity imports to the project electricity system.
Measured/ Calculated / Default:	Not applicable.
Source of data:	This information was directly obtained by the CDEC-SIC Dispatch Center.

Value(s) of monitored parameter:	Does not apply since there is no interconnection with other transmission systems.
Monitoring equipment:	Not applicable.
Measuring/ Reading/ Recording frequency:	Not applicable.
Calculation method (if applicable):	Not applicable.
QA/QC procedures:	To date, the SIC system is not interconnected with any other transmission system, either of Chile or any other country.
Purpose of data:	Baseline emission calculations.
Additional comment:	---

Data / Parameter:	$COEF_{i,jy\ IMPORTS}$
Unit:	(tCO_2/ton) or (tCO_2/m^3)
Description:	CO_2 emission coefficient of fuels used in connected electricity systems (if imports occur).
Measured/ Calculated / Default:	Not applicable
Source of data:	This information was directly obtained by the CDEC-SIC Dispatch Center.
Value(s) of monitored parameter:	Does not apply since there is no interconnection with other transmission systems. Since there are no imports in the SIC this variable is currently not used in the emission reduction calculation. The data used for baseline emission calculations is 0 (tCO_2/ton) or 0 (tCO_2/m^3).
Monitoring equipment:	Not applicable.
Measuring/ Reading/ Recording frequency:	Not applicable.
Calculation method (if applicable):	Not applicable.
QA/QC procedures:	Not applicable.
Purpose of data:	Baseline emission calculations.
Additional comment:	---

D.3. Implementation of sampling plan

Not applicable

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

Differences in baseline and project emission calculations included in tables below are due to the fact that all calculations are done directly in excel spread sheets, which implies a decimal precision that is not carried over onto word formatted tables because decimals are truncated and rounded down. Exact resulting values can be viewed directly in emission reduction calculation spread sheet.

The net quantity of increased electricity generation is calculated using equation N° 13 of the ACM0006 (Version 02).

$$EG_y = EG_{project\ plant,y} - \varepsilon_{el,other\ plant(s)} \cdot \sum BF_{i,y} \cdot NCV_i$$

Where:

EG_y:	is the net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during the year y in MWh.
$EG_{project\ plant,y}$:	is the net quantity of electricity generated in the project plant during the year y in MWh.
$\varepsilon_{el,other\ plant(s)}$:	is the average net energy efficiency of electricity generation in (the) other power plant(s) that would use the biomass fired in the project plant in the absence of the project activity, expressed in MWhel/MWh biomass
$BF_{i,y}$:	is the quantity of biomass type i used as fuel in the project plant during the year y in a volume or mass unit, and
NCV_i:	is the net calorific value of the biomass type i in MWh per mass or volume of biomass

The total emission reduction due to displacement of electricity is calculated using equation N°8 of t he ACM0006 (Version 02):

$$ER_{electricity,y} = EG_y \cdot EF_{electricity,t}$$

where:

$ER_{electricity,y}$:	Emission reductions due to displacement of electricity during the year y in of tCO_2
EG_y:	is the net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during the year y in MWh,
$EF_{electricity,y}$:	is the CO_2 emission factor for the electricity displaced due to the project activity during the year y in tCO_2/MWh.

The corresponding calculations for the monitored period are presented below.

Data:

	Units	2011	2012
(1) CO_2 emission factor of the grid.	(tCO_2/MWh)	0.718	0.727
(2) Net quantity of electricity generated in the project plant.	(MWh)	501,045	511,582
(3) Average net efficiency of electricity generation in the reference plant.	(%)	12.31	12.31
(4) Quantity of biomass type black liquor used as fuel in the project plant.	(tDS)	1,248,548	1,465,417
(5) Net calorific value of biomass type black liquor	(GJ/tDS)	10.70	10.70

Calculations:

		2011	2012
(6) Electric power displaced from the grid.	(2) –(3)*[(4)*(5)]*(1 MWh)/(3.6 GJ)	98,814(MWh)	39,484(MWh)
(7) Total grid emission savings.	(1)*(6)	71,014(tCO_2)	28,697(tCO_2)

Total baseline emissions	**(tCO_2)**	**71,014(tCO_2)**	**28,697(tCO_2)**

Determination of the emission factor of the grid electricity generation:

The parameter EF should be determined as the combined margin CO_2 emission factor for the grid to which the project activity is connected in year y, calculated according to the ACM0002 (version 04). This calculation is presented below:

a) Operating Margin calculations:

In this case the OM; emission factor is calculated using the simple/adjusted method equation N°4 of the ACM0002 (Version 04). The Project Participant used ex-post data to calculate this parameter, that is, the coefficient was calculated in year in which the project generation occurs, in this case corresponds to years 2011 and 2012.

The Project Participant used data from 2011 and 2012 to determine the lambda factors that express the percentage of the time when low-cost/must-run sources were on the margin for 2011 and 2012:

$$\lambda_y = \lambda_{2011} = 0.000114153$$
$$\lambda_y = \lambda_{2012} = 0.000000000$$

The rest of the parameters used to calculate the EF_{grid} for 2011 and 2012 were obtained from the CDEC-SIC dispatch centre (official and public information. The calculation is as follows:

- CO_2 emission of non-low cost/must-run power sources for 2011 and for 2012

$$\sum_{i,j} F_{i,j,2011} \cdot COEF_{i,j} = 17{,}542{,}292(tCO_2 / y)$$
$$\sum_{i,j} F_{i,j,2012} \cdot COEF_{i,j} = 18{,}074{,}532(tCO_2 / y)$$

- The total power generation in the SIC by non-low-cost/must-run power sources in 2011 and 2012:

$$\sum_j GEN_{j,2011} = 23{,}947(GWh/y)$$
$$\sum_j GEN_{j,2012} = 26{,}006(GWh/y)$$

- The CO_2 emissions of low-cost/must run power sources in 2011 and 2012. Note that since in Chile low-cost/must run power sources include mostly hydro energy, the total emissions for this part of the equation are low:

$$\sum_{i,k} F_{i,k,2011} \cdot COEF_{i,k} = 380{,}576(tCO_2/y)$$
$$\sum_{i,k} F_{i,k,2012} \cdot COEF_{i,k} = 528{,}905(tCO_2/y)$$

- Total power generation in the SIC by low-cost/must-run resources for 2011 and 2012

$$\sum_k GEN_{k,2011} = 22{,}166(GWh/y)$$
$$\sum_k GEN_{k,2012} = 22{,}852(GWh/y)$$

Replacing the above values in the equation used to calculate the EF for the year 2011 and 2012, the operating margin results:

$$EF_{\mathrm{OM},2011} = (1-0.00011415)\cdot\frac{17{,}542{,}292}{23{,}947} + 0.00011415\cdot\frac{380{,}576}{22{,}166} = 732.48(\mathrm{tCO_2/GWh})$$
$$EF_{OM,2011} = EF_{OM,simpleadjusted,2011} = 0.732(tCO_2/GWh)$$

$$EF_{OM,2012} = (1-0.00000000)\cdot\frac{18{,}074{,}532}{26{,}006} + 0.00000000\cdot\frac{528{,}295}{22{,}852}(tCO_2/GWh)$$
$$EF_{OM,2012} = EF_{OM,simpleadjusted,2012} = 0.695(tCO_2/GWh)$$

b) Build Margin calculation

According to 2011 and 2012 SIC data, the group of plants that accounts for the largest generation in each year are the ones responsible for the 20% of the total generation in 2011 and 2012, respectively. These plants are considered to calculate the Build Margin for 2011 and 2012:

$$EF_{BM,2011} = 0.704(tCO_2/MWh)$$
$$EF_{BM,2012} = 0.758(tCO_2/MWh)$$

As in the previous case, the Build Margin calculation also considered official CDEC-SIC data and/or other official data publicly available.

Having obtained the Operating Margin $EF_{OM,y}$ and the Build Margin $EF_{BM,y}$, for 2011 and 2012, and assuming the default value of (0.5) for the weights W_{OM} and (0.5) for the W_{BM}, it is possible to calculate $EF_{grid\ CM,y}$ for the year 2011 and 2012:

$$EF_{electricity,2011} = 0.5*0.732 + 0.5*0.704 = 0.7186 \ (tCO_2/MWh)$$

$$EF_{electricity,2012} = 0.5*0.695 + 0.5*758 = 0.7268 \ (tCO_2/MWh)$$

E.2. Calculation of project emissions or actual net GHG removals by sinks

The only project emission corresponds to the consumption of some fossil fuel in the recovery boiler, which is attributable to additional power generation to the grid. This is calculated using equation N°6 of the ACM0006 (Version 02):

$$PEFF_y = \sum FF_{projectplant,i,y} \cdot COEF_{CO2,i}$$

The corresponding calculation is shown below:

Data:

	Units	2011	2012
(1) On-site fossil fuel consumption of type Diesel for co-firing in the project plant.	(ton)	2,609	831
(2) On-site fossil fuel consumption of type Natural Gas for co-firing in the project plant.	(ton)	0.0	0.0
(3) On-site fossil fuel consumption of type Fuel Oil for co-firing in the project plant.	(ton)	0.25	1,205.94
(4) Diesel emission factor.	(tCO_2/000ton)	3,174	3,170
(5) Natural gas emission factor.	(tCO_2/MMm^3)	2,081	2,007
(6) Fuel Oil emission factor.	(tCO_2/000ton)	3,109	3,109
(7) Nat. gas density (gaseous phase).	(Kg/m^3)	790.13	724.81

Calculations:

	Calculation procedure	2011	2012
(8) Diesel emissions.	(1)*(1/1,000)*(4)	8,282(tCO_2)	2,634(tCO_2)
(9) Nat. gas emissions	[(2)*1,000/(7)]*(1/1,000,000)*(5)	0.0(tCO_2)	0.0(tCO_2)
(10) Fuel Oil.	(3)*(1/1,000)*(6)	0.77(tCO_2)	3,750(tCO_2)
Total fossil fuel emissions	(8)+(9)+(10)	8,283	6,383

Total project emissions	**(tCO_2)**	**8,283**	**6,383**

E.3. Calculation of leakage

As described in section E.2 of the registered PDD, no leakage is anticipated from the implementation of the project activity.

$$Ly = 0$$

E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

Item	Baseline emissions or baseline net GHG removals by sinks (t CO_2e)	Project emissions or actual net GHG removals by sinks (t CO_2e)	Leakage (t CO_2e)	Emission reductions or net anthropogenic GHG removals by sinks (t CO_2e)
Total (2012)	**28,697**	**6,383**	**0**	**22,314**
Total (2011)	**71,014**	**8,283**	**0**	**62,730**
Net emissions claimed	**99,711**	**14,666**	**0**	**85,044**

E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (t CO_2e)	(Year 2012): 126,144(tCO_{2e})	(2012):22,314(tCO_{2e})
	(Year 2011):126,144(tCO_{2e})	(2011):62,730(tCO_{2e})

E.6. Remarks on difference from estimated value in registered PDD

(2012):

According to the PDD, the estimated emission reductions for the period covered from 01/01/2012-31/12/2012 should have been 126,144 (tCO_2). However, the monitored emissions reductions are 82.23% lower than the estimated in the PDD. This difference can partially be explained by the following reason:

According to the PDD, the estimated amount of electricity displaced from the grid should have been 262,800 (MWh/y)[2]. During this period the net quantity of increased electricity generation is determined by using the equation 13 of the ACM0006 (Version 02), and the resulted to be 84.9% lower than the value estimated. This can be explained due to the abnormal operations faced by the power plant in one of its turbo generator (TG3) which was out of serviced from January to April in 2012.

(2011):

According to the PDD, the estimated emission reductions for the period covered from 01/01/2011-31/12/2011 should have been 126,144 (tCO_2). However, in this case the monitored emissions reductions are 50.27% lower than the estimated in the PDD. This difference can partially be explained by the following reason:

[2] Note that the total energy displaced from the grid was calculated from multiplying the Net power out-put with the average load factor calculated using official CDEC-SIC data and data provided from Nueva Aldea Phase 2.

During this monitored period the net quantity of increased electricity generation resulted to be 84.9% lower than the value estimated in the PDD of 262,800 (MWh/y). This can be explained as the turbo generator (TG3) which was out of serviced from September to December in 2011.

Considering the above, the low monitored emission reductions in 2012 and 2011 compared to the estimated emission reduction amount in the PDD is mainly attributed to the low amount of electricity generated due to operational problems faced in the turbo generator (TG3).

E.7. Actual emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards.

Item	Actual values achieved up to 31 December 2012	Actual values achieved from 1 January 2013 onwards
Emission reductions or GHG removals by sinks (t CO_2e)	85,044tCO_{2e}	Not applicable.

Note that the emission reductions claimed are from the monitoring period from January 1st 2011 to December 31st 2012

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Document information

Version	*Date*	*Description*
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net anthropogenic GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	28 May 2010	EB 54, Annex 34. Initial adoption.

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